2016 • Third Quarter Issue

MileMarker

A CALTRANS PERFORMANCE REPORT

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Caltrans

Message from the **Director**

I am very pleased to say Caltrans has published its much-anticipated California Transportation Plan 2040. This sustainable plan lays out a path to a busy, prosperous and sustainable California in the year 2040 by setting a framework to improve mobility and safety for all modes while also reducing greenhouse gas emissions.

This plan is being released at a time when we already face many challenges. The combination of prolonged drought and a wetter-than-normal winter had us digging out from mudslides, shoring up eroding hillsides, and rebuilding a bridge on an interstate. By midsummer, we'd endured a wildfire season that damaged roads, forced evacuations and left denuded hillsides vulnerable to even more slides next winter.

And we of course continued our never-ended struggle to maintain our infrastructure and efficiently move people and goods.

I mention this to underscore the importance of the California Transportation Plan 2040, which lays out a vision of a sustainable, multimodal transportation system that also reduces green-house gas emissions. Accomplishing both of these objectives — meeting our growing demand for mobility, while reducing emissions — is no small challenge; but it is one we must strive for.

The sustainable transportation system envisioned in the CTP 2040 aligns with all of our long-range modal plans: the Interregional Transportation Strategic Plan, the Freight Mobility Plan, the State Rail Plan, the California High-Speed Rail Business Plan, the Statewide Transit Strategic Plan, the Aviation System Plan, and it also anticipates the first-ever bicycle and pedestrian plan which will be released next year.

All of this helps guide our efforts and investments going forward, and all of it is in lockstep with our Strategic Management Plan.

So how do we get there? The 25-year plan calls for improving our highways and roads and reducing congestion with new technologies, high-occupancy vehicle lanes, smart corridors and more. We do it by using intelligent asset-management and focusing on our fix-it-first approach to reduce long-term maintenance costs. We do it by increasing transit options, by making goods movement more efficient, by improving safety for all users on all systems, by facilitating the shift to cleaner, more efficient vehicles, and by ensuring that all of our undertakings stay focused on the quality of lifein our communities. All of this, of course, is dependent on secure stable and dependable funding for transportation.

Malcolm Dougherty, *Director of Caltrans*

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Cover: *A young woman releases doves in "Superheroes #3," a community mural in the West Street underpass at Interstate 580. The work, by David Burke and Javier Rocabado with students from West Oakland Middle School, is one of more than 400 added to the state highway system since Caltrans initiated its Transportation Art Program in 1977. See story, page 14*

PERFORMANCE GOALS

Caltrans **Mile Markers**

SAFETY AND HEALTH

Percentage of Active Transportation Funds Allocated vs. Programmed

Cycle 1

■ 37%
State FY 2015-16
(previous: 9%)

■ 98%
State FY 2014-15
(previous: 73%)

Percentage Of Active Transportation Projects Awarded Within Six Months

State FY 2015-16, Quarter 4

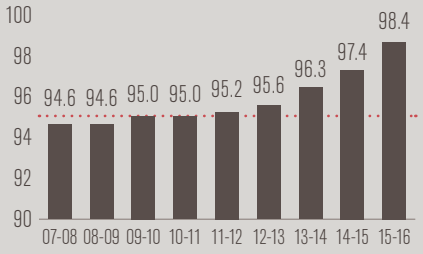
Previous period: 89%

Most recent data available

	2012	2013	Goal
Worker Fatalities in Work Zones	0	0	0 per calendar year
Auto Fatalities per 100 Million Vehicle Miles Traveled	0.67	0.67	Less than 0.5
Pedestrian Fatalities	187	257	Reduce 10% annually
Bicycle Fatalities	26	30	Reduce 10% annually

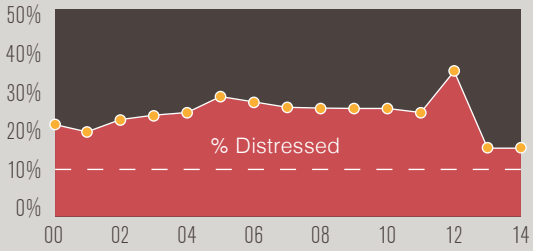
STEWARDSHIP AND EFFICIENCY

Bridge Health Index



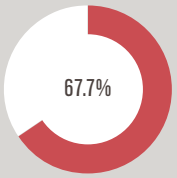
Goal: better than 95 rating by 2020

Pavement Health Index



Goal: less than 10% distressed by FY 2024-25

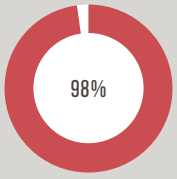
Percentage of Intelligent Transportation Systems in Working Order



Previous period: 65.6%

Goal: 90% by 2020

Planned Projects Delivered in Fiscal year 2015-16

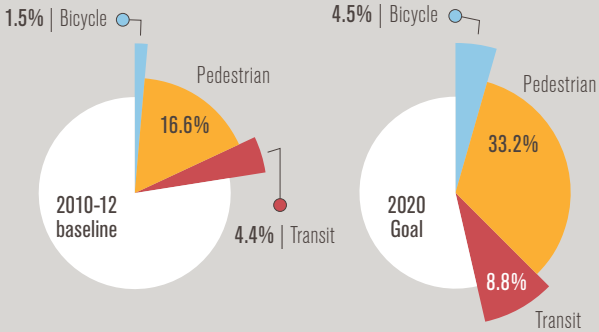


Previous period: 98%

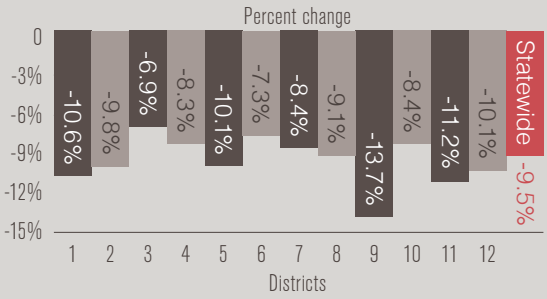
Goal: 100% annually

SUSTAINABILITY, LIVABILITY AND ECONOMY

Percentage of Commutes

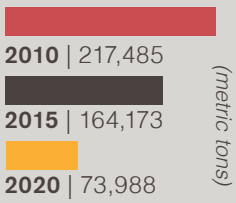


Vehicle Miles Traveled per Capita (2014)



Goal: 15% reduction by 2020

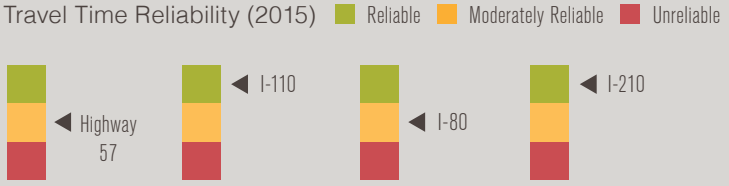
Greenhouse Gas Emissions from Caltrans Operations



Goal: 20% reduction from 2010 baseline by 2020

SYSTEM PERFORMANCE

Travel Time Reliability (2015)



Goal: by 2020, one-tier improvement from established baseline

2016 End Station On-Time Performance for Intercity Rail Trips

Previous period: 80.2%

Goal: 90% by 2020

Caltrans **Mile Markers**, *continued on page 27*

Shovel-Ready

Year-End Tally: 239 Projects Ready for Construction

A backhoe removes pavement to replace a section of bridge deck on an elevated stretch of U.S. Highway 50 through Sacramento in 2014.

Project delivery, one of Caltrans' key performance measures, requires completing design work and engineering, lining up permits, engaging stakeholders and identifying funding so that it can be handed over to a contractor for construction. All of that has to be done before the first shovel hits the dirt.

Caltrans committed to make 244 projects shovel-ready for fiscal year 2015-16, with a total value of $2.1 billion. By June 30, the close of the fiscal year, all but five of those projects (239) had met the delivery deadline. That is a 98-percent project delivery rate, just short of Caltrans' 100 percent goal. Similarly, the department did not meet its goals on another set of progress indicators (see chart, p.3)

Because most capital projects face unanticipated challenges along the way, the department provides the California Transportation Commission (CTC) a watch list of projects that are "at risk" of not conforming to budget or schedule expectations. Dozens of projects were added and removed from the watch list in 2015-16.

The list alerts the CTC to potential changes to the cost or schedule of a project. CTC approval is required for significant changes.

Before presenting changes to the CTC, Caltrans thoroughly examines each request to validate costs, evaluate options and justify actions.

In addition to bringing 239 more projects to construction, in fiscal year 2015-16, Caltrans completed construction on 183 projects, 99 percent of which were completed within the CTC's budgeted allocation and Caltrans' delegated funding authority. The costs of projects closed-out this year were $1.85 million in State Transportation Improvement Program (STIP) projects, 97 percent of total STIP funding, and $1.44 million for the State Highway Operation and Protection Program (SHOPP) projects, 89 percent of total approved SHOPP funding. MM

***Source:** Rich Williams, Michael Whiteside / Division of Project Management*

Planned Projects, Statewide 2015-16

Milestone	Planned	Actual	Goal	Percent	Goal Met
Draft Environmental Documents Completed	82	62	> 80%	76%	No
Projects Approved	263	223	> 90%	85%	No
Projects with Right of Way Certified	260	251	100%	97%	No
Projects Designed and Ready for Construction	244	239	100%	98%	No
Value of Projects Ready for Construction (millions)	$2,052	$1,721	100%	84%	No
Construction Contracts Accepted	209	183	> 95%	88%	No

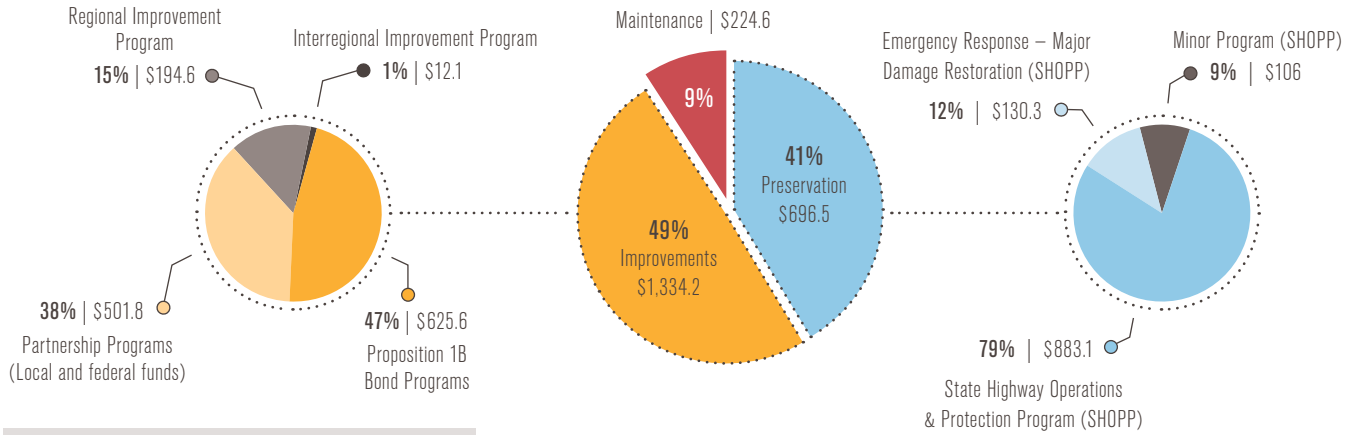
The 62 projects with completed draft environmental documents and the 223 projects that were approved this year will be shovel-ready in a future fiscal year. Of the 251 projects where Caltrans obtained right of way, most are now shovel-ready, the rest will be shovel-ready in FY 2016-17. The 239 designed and ready for construction are shovel-ready and will be put out to bid and begin construction during FY 2016-17.

Additional Projects, Statewide 2015-16

Milestone	Number
Draft Environmental Documents Completed	25
Projects Approved	64
Projects with Right of Way Certified	42
Projects Designed and Ready for Construction	48
Construction Contracts Accepted	131
Value of Projects Ready for Construction (millions)	$383

Additional projects generally fall into the following categories: emergency projects, safety projects, projects from a prior year and projects from a future year delivered early. Source: Fiscal Year 2016-16 Project Delivery Report (to be submitted to California Transportation Commission Oct. 15, 2016)

Projects Constructed, 2015-16: Contract Value by Program Funding *(millions)*



Note: Total percentages may not equal 100% due to rounding.

State Budget Includes **Less for Transportation**

Caltrans will have fewer employees and less money for operations than at any time in the last decade, under terms of the recently enacted state budget.

The 2016-17 budget includes $9.7 billion for Caltrans, about $800 million less than last year, and authorizes 19,044 positions, 252 fewer than last year.

It continues a decade-long slide from the short-term peak that came with voter approval of Proposition 1B (The Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006). Nearly all of the projects laid out in Proposition 1B have been completed and Caltrans has gradually eliminated about 4,200 positions. The reductions total nearly 30 percent in funding and more than 26 percent in project direct staffing, including an 11 percent decrease in project direct staffing in just the last six years.

The 2016-17 budget includes $9.7 billion for Caltrans, about $800 million less than last year, and authorizes 19,044 positions, 252 fewer than last year.

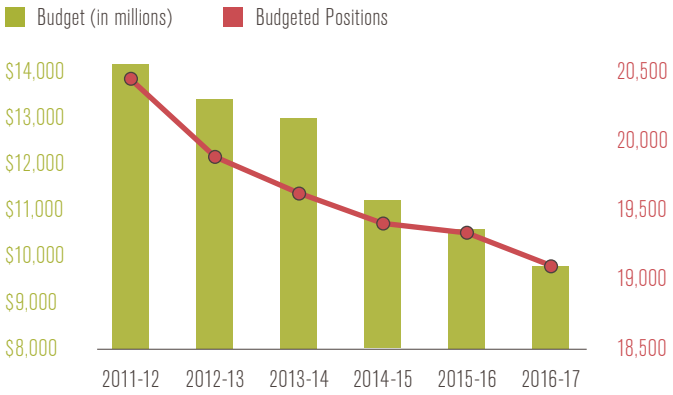
The 2016-17 budget fully funds the programmed projects for the State Highway and Operation Protection Program and the State Transportation Improvement Program, and it includes an early loan repayment of $148 million for projects in the Traffic Congestion Relief Program. However, these resources are not sufficient to address the growing backlog of state highway system maintenance needs.

While no provision for addressing the transportation funding shortfall was included in the enacted budget, the special legislative session will continue. Gov. Edmund G. Brown Jr. continues his support for a sustainable transportation funding solution, including the plan he put forth that would bring $36 billion in new transportation revenue over the next 10 years. MM

Source: *Gina L. Coates, Chief, Revenue Forecasting & Financial Analysis Branch, Division of Budgets; Athena Gliddon, Chief, Office of Capital and Finance*

The completion of most Proposition 1B projects has resulted in an 11 percent decrease in project direct staffing in just the last six years.

Caltrans Budget & Staffing Levels: Six-Year Look



Caltrans budget and staffing levels have both been on the decline since fiscal year 2008-09, when the effects of the Great Recession took hold. The budget returned to pre-recession levels in 2011-12, but has declined each year since.

Rapid Response

Caltrans Rebuilds I-10 Bridge after 1,000-Year flood

Few who traveled Interstate 10 between Riverside and Phoenix could have distinguished the Tex Wash Bridge from the dozens of other nondescript 1960s-era spans over dry creek beds in the parched desert.

But that was before 6.7 inches of rain fell on the Chuckwalla Mountains on July 19, 2015, in what the National Weather Service deemed a 1,000-year flood. A massive torrent gushed off the mountains sweeping away the bridge's embankment and foundation, collapsing the eastbound lanes, injuring a motorist and dramatically undermining the two-lane span on the westbound side of the parallel bridge.

Suddenly, the crucial corridor linking California and Arizona was closed. Caltrans diverted traffic between State Route 177 and SR-86 as engineers assessed the damage and surveyed the 58 other bridges within 30 miles. Delay was not an option. I-10 is one of Southern California's most important east-west arteries, carrying billions of dollars' worth of tourism and commerce. Approximately 27,000 cars and trucks cross that bridge daily.

The bridge, or more precisely 30 feet of it, came down on a Sunday. The following Friday, the interstate was opened again. Of course, the fallen structure had not yet been replaced. Instead, crews reinforced the still-standing westbound side of and built a temporary crossover lane in the median for eastbound traffic.

As internet users watched on a live stream from the site, crews placed 1,400 truckloads of fill dirt and laid down 2,500 tons of asphalt to create the temporary detour and get traffic moving again.

The big question at that point was whether to rehabilitate the old eastbound bridge or to tear it down

Workers guide one of 10 girders, each weighing 55 tons, during construction of the new Tex Wash Bridge.

completely and reconstruct it. Plans for both choices were being drawn up simultaneously. In the end, it was decided that a rehabilitation would have left them with a 50-year-old bridge that would still be susceptible to collapse in case of similar floods (while statistically improbable, 1,000-year floods could happen at any time).

At that time, John Bulinski had not yet been appointed director of District 8. He was acting in that capacity until the director made a permanent selection. This project "was part of my interview," he joked recently, almost a year after receiving his appointment.

Though ultimately responsible for the project, Bulinski had many partners. Caltrans staff, contractors and other stakeholders all had roles in building the new bridge. The Federal Highway Administration, Riverside County and several other federal, state and local agencies helped obtain necessary clearances before construction could begin. Caltrans also worked with the California Department of Fish and Wildlife to address concerns about the desert tortoises living in the area. Even Arizona officials were "heavily involved," helping out with alerting truckers on their way to California to the various detours initially required on the California side.

Granite Construction Co., based in Watsonville, was hired as lead contractor the day after the collapse under time-saving emergency contracting procedures. Granite was paid for time and materials without added bonuses. Getting the westbound bridge open and demolishing the eastbound bridge, cost $5 million. An additional $6 million was needed to rebuild the eastbound bridge.

The new bridge has a much deeper foundation than the 1967 original. Engineers included piles 48 inches in diameter extending 52 feet below ground for the footing. The existing westbound bridge received two 48-inch supports extending 23 feet deep.

Engineers also redesigned the eastbound bridge to current standards, using one span. Using Accelerated Bridge Construction methods — meaning building many portions offsite to reduce time and minimize road closures and traffic disruptions — 10 girders, each weighing 55 tons, were built offsite by Oldcastle Precast, 130 miles away in Perris, south of Riverside. Likewise, the abutments, made up of 240 cubic yards of concrete, were also made in Perris.

The new bridge has a much deeper foundation than the 1967 original. Engineers included piles 48 inches in diameter extending 52 feet below ground for the footing. The existing westbound bridge received two 48-inch supports extending 23 feet deep.

By eliminating the need for formwork, this process likely shaved a month off the construction time, Bulinski said.

Less than two months after the collapse, Interstate 10 was fully back in business. And should another 1,000-year flood occur there, Bulinski said the chance of another bridge collapse is "doubly, extremely unlikely." MM

Source: *District 8 Director John Bulinski, Information Officer Tyeisha Prunty*

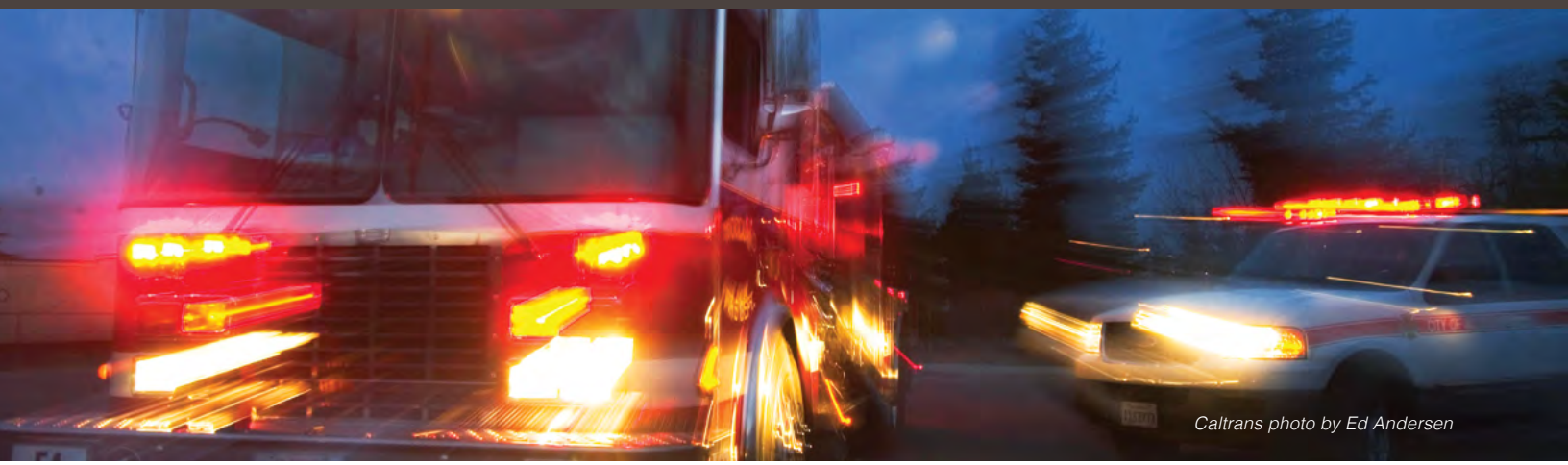
Caltrans Identifying Bridges with Similar Designs

With the ground still soggy from the deluge, specially trained Caltrans engineers pored over the collapsed Tex-Wash Bridge to learn precisely why it succumbed to the freak flash flood. Interstate 10 has dozens of similar bridges, any of which could one day be subjected to a so-called 1,000-year storm.

Members of the Structures Maintenance and Investigations Hydraulics team reviewed plans for those other bridges. They looked for abutment designs similar to Tex Wash, shallow footings dependent on decades-old rock slope protection. About 70 were deemed vulnerable, so the team recommended replacing the old rock slopes with new and better ones that feature not only larger material, but meshing to hold the supporting soil in place. Additional advanced hydraulic modeling is planned for some of these structures to determine if some of the piers may need added protection as well. Caltrans is conducting a similar analysis to identify bridges along I-40 that have vulnerable abutments.

Trend Spotting

Collisions Mostly Caused by Speeding, Aggressive Driving



Caltrans photo by Ed Andersen

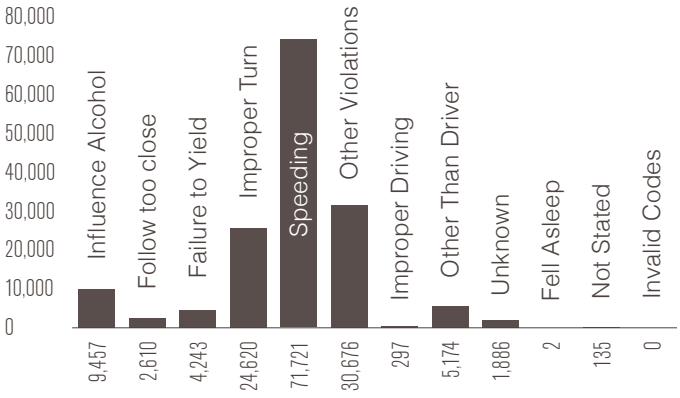
Speeding and aggressive driving were the most frequent causes of incidents on the California state highway system, with nearly 20 percent of traffic-related fatalities and severe injuries being speed-related, according to the 2013 Collision Data on California State Highways report, released in July.

In the 2013 report, the most recent year for which data is available, more than 71,000 collisions were attributed to speeding. Likewise, rear-end collisions occurred far more often than "sideswipes," the second-leading type (see charts).

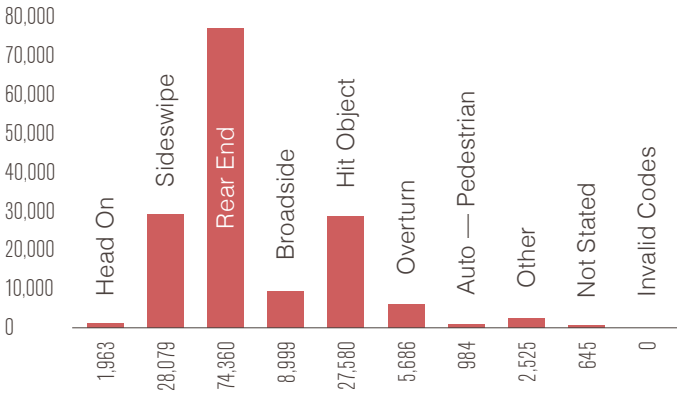
Despite these seemingly large numbers, traffic-related fatalities on California's highway system — and the nation as a whole — are actually continuing a downward trend.

Many people attribute the decline in traffic-related fatalities and severe injuries in the past eight years to the economic downturn when fewer jobs and less income led to less driving and therefore reduced exposure. The rate of driving is reflected in vehicle miles traveled (VMT). However, in California, VMT did not decline much during the economic

2013 All Accidents by Primary Collision Factor

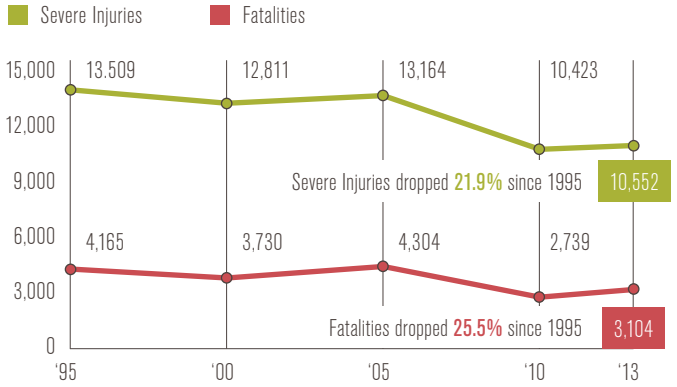


2013 All Accidents by Type of Collision



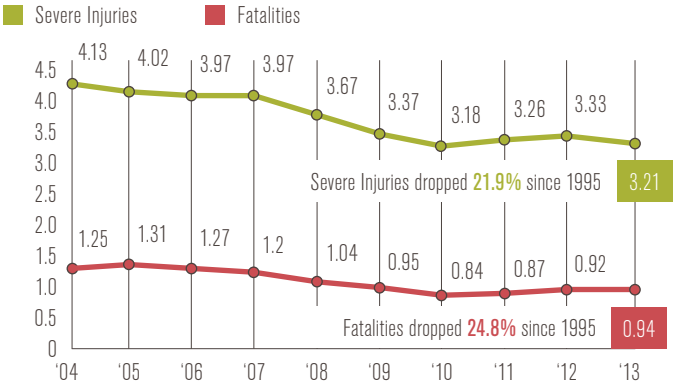
Source: 2013 Collision Data on California State Highways report

Collisions Resulting in Fatalities, Severe Injuries



Source: 2013 Collision Data on California State Highways report

Collisions Resulting in Fatalities, Severe Injuries *(per million vehicle miles)*



As the number of motorists on the California State Highway System has increased, the number of collisions leading to death or severe injuries per million vehicle miles has generally decreased.

downturn, and remained relatively flat between 2003 and 2013 compared to previous decades.

The Caltrans Traffic Accident Surveillance and Analysis System (TASAS) Collision Coding Unit processes more than 180,000 traffic collision reports annually. The unit identifies the post-mile location for each incident on the state highway system, using location information from first responders. A small number are collected through the Caltrans district offices.

The federally mandated and funded Highway Safety Improvement Program assists Caltrans with decreasing the number and severity of collisions in California.

Caltrans uses the Transportation System Network database to identify locations with significantly high collision concentrations, wrong-way collisions (see story, page 25) and collisions across medians and multiple lanes, run-off road collisions and collisions involving pedestrians. The identified locations are systematically investigated to determine probable causes of the collisions in order to implement effective countermeasures to improve safety.

Nearly 3,000 traffic safety investigations were processed in calendar-year 2015. In addition, Caltrans processed 509 "other safety" investigations prompted by calls, letters, emails, etc., from the public.

In February 2012, Caltrans launched a five-year "California Roadway Departure Safety Implementation Plan." The plan identified more than 7,000 locations for possible low-cost countermeasures to systematically implement on many state highways in an effort to reduce roadway departure crashes. MM

***Source:** Brian Domsic, Traffic Accident Surveillance & Analysis System (TASAS), Division of Research, Innovation and System Information; 2013 Collision Data on California State Highways report*

Pedestrian Fatality and Injury Data

2013 Statewide

Highway Type	Fatality	Injury	Total
Expressway	11	37	48
Freeway	169	611	780
Conventional Highway	76	565	641
One-Way City Street	1	11	12
Total	257	1,224	1,481

Bicycle Fatality and Injury Data

2013 Statewide

Highway Type	Fatality	Injury	Total
Expressway	8	23	29
Freeway	7	307	315
Conventional Highway	16	760	776
One-Way City Street	0	20	20
Total	30	1,110	1,140

Source: 2013 Collision Data on California State Highways report

Freight Plan Addresses **Environment and Economy**

Caltrans photo by Scott Lorenzo/Steven Hellon

One of the statewide goals is to deploy more than 100,000 zero-emission freight vehicles and maximize the use of near-zero emission freight vehicles and equipment powered by renewable energy by 2030.

Freight movement generates about a third of California's $2.2 trillion economy and about half of its diesel particulate matter, making it a key source of prosperity and a natural focus of clean-air efforts.

In addressing the twin imperatives of environment and economy, Gov. Edmund G. Brown Jr. last year called on three of his agency secretaries to create an integrated freight action plan that both bolsters the economy and achieves significant greenhouse gas reduction.

The secretaries of the California State Transportation Agency, California Environmental Protection Agency and the California Natural Resources Agency — with the aid of their respective departments — as well as the Governor's Office of Business and Economic Development, released a draft California Sustainable Freight Action Plan last spring to solicit further public input. Outreach was extensive throughout the process before the final plan's release in July.

From July 2015 through spring 2016, the state agencies held a series of public workshops and webinars, regular meetings with the California Freight Advisory Committee, as well as numerous meetings with individuals and stakeholder groups such as industry associations, labor, environmental and community groups, California Native American tribes and small businesses.

The result of significant research as well as input from stakeholders and the public, the plan lays out three central statewide goals.

System Efficiency Target

Improve freight system efficiency 25 percent by increasing the value of goods and services produced from the freight sector, relative to the amount of carbon that it produces by 2030.

Transition to Zero Emission

Deploy more than 100,000 zero-emission freight vehicles and maximize the use of near-zero emission freight vehicles and equipment powered by renewable energy by 2030.

Competitiveness and Growth

Establish targets for increased state competitiveness and economic growth within the freight and goods movement industry based on metrics and models developed by a working group of economists, experts and industry leaders.

The plan also outlines dozens of steps to achieve the following nine broad actions over the next five years.

1. Work with the Legislature to enact a freight transport system funding package that enables new investment consistent with the long-term Vision and Guiding Principles.
2. Work with the Legislature to enable distribution of federal Fixing America's Surface Transportation Act funds to improve freight corridors.
3. Focus on modern freight corridors, identifying high-priority projects with multiple benefits for future funding, and establish performance criteria.
4. Accelerate use of clean technologies through targeted introduction of zero and near-zero emission technologies, and continued development of renewable fuels.

What's at Stake

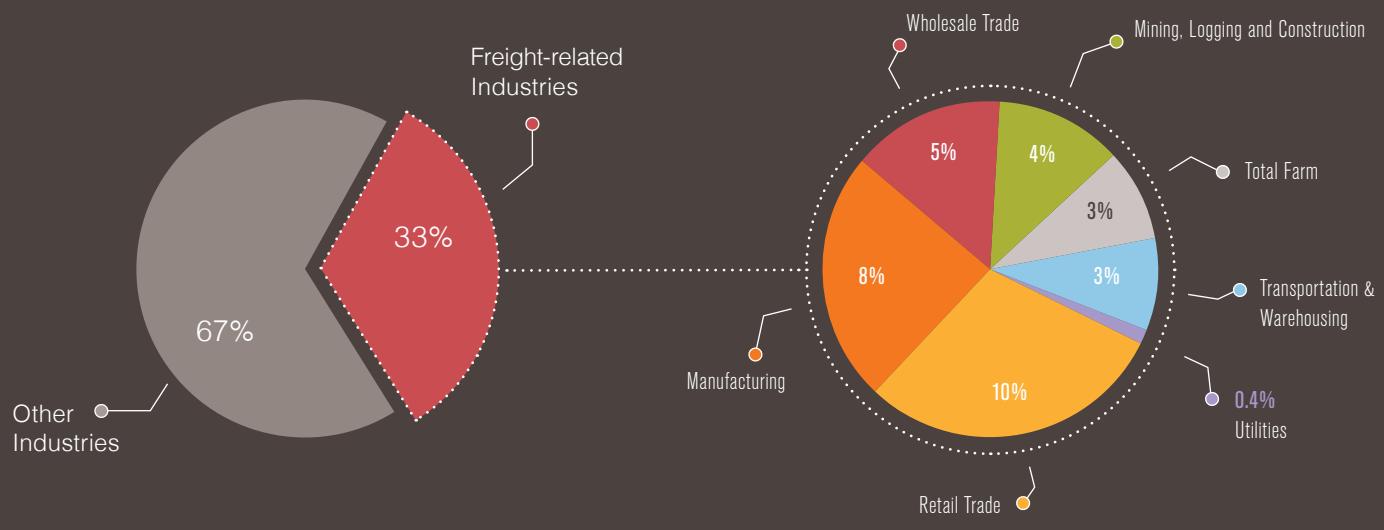
California is the nation's largest gateway for international trade and domestic commerce. Freight-dependent industries accounted for more than $740 billion in gross domestic product and more than 5 million jobs in 2014 (see chart).

Those numbers will grow. The Federal Highway Administration predicts that between 2015 and 2045, California freight tons will increase by 59 percent and freight value by 133 percent. Trucking is expected to continue to have the dominant share of that load.

Freight equipment currently accounts for about half of the statewide diesel particulate matter emissions, which are both a toxic air contaminant and a contributor to black carbon, a powerful short-lived climate pollutant. Freight operations also account for approximately 45 percent of the statewide nitrogen oxides emissions and 6 percent of the statewide greenhouse gas emissions.

Reducing these pollutants will help the state comply with the federal Clean Air Act, as well as California's own new and aggressive targets for reducing greenhouse gas emissions 40 percent below 1990 levels by 2030 in order to combat climate change.

2014 California Industry Employment Composition



Source: State of California Employment Development Department, Labor Market Information Division

5. Convene a freight think tank to anticipate future demand and identify technologies, solutions, partnerships and critical steps to meet that demand.
6. Work with industry stakeholders to identify targets and strategies for continued viability and competitiveness of California's statewide and local freight transport system. Develop metrics, models, and other tools to analyze the costs, benefits and impacts of actions on economic growth and competitiveness.
7. Work with the freight efficiency development group to improve freight transport in California consistent with the objectives of the overall plan.
8. Convene stakeholders and the California Workforce Development Board to develop and sustain a skilled labor force that meets the needs of an expanding sustainable freight system.
9. Develop a process involving federal, regional and local agencies, as well as industry, environmental and community stakeholders to identify ways to expedite project delivery, while upholding public participation and assessment of environmental, community, and health impacts.

Work on the Sustainable Freight Action Plan will continue into 2018. MM

Source: *California Sustainable Freight Action Plan; Chris Schmidt, AICP Senior Transportation Planner*

California's Freight System **at a Glance**

12	Deep-water seaports	5,800	Centerline miles of high-traffic volume interstate and state highways
5,300	Miles of freight railroad tracks	3	International commercial land ports of entry
12	Airports with major cargo operations	19,370	Miles of hazardous liquid and natural gas pipelines

The Pilot Projects

The California Sustainable Freight Action Plan includes three conceptual pilot projects that may offer partnering opportunities in the coming years.

Dairy Biomethane for Freight Vehicles
(San Joaquin Valley)

Explore potential of a commercial-scale, dairy biogas-sourced, biomethane fueling facilities for use in freight and other vehicles. The pilot may focus on implementation of pipeline injection and the construction of the fueling station.

Advanced Technology for Truck Corridors
(Southern California)

Explore options for advanced intelligent transportation systems, connected and semi-autonomous vehicle technologies, collaborative logistics, and potential incentives for zero- and near-zero emission trucks. The pilot may focus on freight signal priority, traveler information systems, and communication systems infrastructure on arterial roads, as well as integrated corridor management on highways.

Advanced Technology Corridors at Border Ports of Entry
(California-Mexico Border)

Explore implementing information systems, innovative operation techniques, and enhanced traffic management technology, as well as incentives for zero and near-zero emission truck crossings at international ports of entry facilities. The pilot may focus on building capacity for technological means of traffic management, such as Bluetooth sensors in the roadway, global positioning system (GPS) readers, variable messaging and a specialized border wait-time application.

The “Sensing Water” display uses paint and projected lighting resembling flowing water and the aurora borealis in a State Route 87 underpass in San Jose. It is influenced by real-time changes in weather and wind that affect the nearby Guadalupe River.

Highway Art Provides **Community Canvas**

Caltrans' Transportation Art Program offers communities a chance to beautify their infrastructure in a way that embraces local sensibilities and reflects regional culture. Since 1977, more than 400 murals, installations and fixtures have been added to the state highway system through the program.

The California Transportation Foundation recently affirmed the program's ability to improve quality of life when it bestowed its Sustainable Transportation/Environmental Enhancement Award on a set of Bay Area additions administered by Caltrans' District 4.

Among those award-winning projects are installations in a pair of San Jose underpasses that stitch together two downtown areas — providing a pleasant pedestrian and bike link between residential neighborhoods and the business district.

The Foundation also honored a life-affirming series of murals painted by local schoolchildren in Oakland, and the popular installation that offers San Francisco residents a light show along the cables of the western span of the Bay Bridge.

Through the years, Caltrans has recognized that art integrated into transportation structures can enhance and reflect the aesthetic, environmental, scenic and cultural values of the affected community. Local artists bring this vision to life. Such art may include graphic or sculptural artwork, either freestanding or placed on required engineering features (such as sound walls, retaining walls, bridges, bridge abutments, bridge rails, or slope paving) that expresses something special about a community's history, resources or character.

The tech components of the San Jose installations, for example, underscore its identity as the unofficial capital of Silicon Valley.

"Sensing You" illuminates Santa Clara Street beneath Interstate 87 which had been considered a somewhat intimidating stretch for pedestrians and bicyclists. It is part of a larger public art effort called Illuminating Downtown Project funded by a $600,000 grant from ArtPlace America.

The "Sensing You" interactive artwork is made up of LED lighting elements, a cell phone interface and painted rings that some have likened to doughnuts — a comparison disliked by the artist. The patterns are activated by sensors that detect pedestrians and bicyclists moving through the space, setting off preprogrammed sequences.

A partnership with Google's Niantic Lab allows players of the online game "Ingress" to "temporarily take control of the space and making manifest in the artwork aspects of the game from their cell phones," according to "Sensing You" artist Dan Corson's website. "Inspired by raindrops on water and the echoing patterns emitting from our cell phones, this artwork seeks to link technology and nature in this urban landscape sitting over the Guadalupe River — at the heart of Silicon Valley."

Caltrans worked with the city to ensure the installation met the criteria of the Transportation Art Program, including that it not distract motorists and that it not use lights like red, yellow or green that are associated with traffic control. The lighting animations are designed to be slow enough so the average driver will not see any movement, but for the pedestrian, the movement will be highly discernable. The patterning was originally inspired by the pattern of

***At left**, the "Superheroes" art project in West Oakland involves murals on three underpasses below Interstate 580 designed and conceptualized by local middle and high school students. **Top right**, "Sensing You" illuminates Santa Clara Street beneath State Route 87 in San Jose. **Bottom right**, Figueroa Street beneath U.S. Highway 101 in Los Angeles.*

Nearly two-dozen artists helped paint this mural on the Buena Vista underpass on State Route 94 in Lemon Grove, in San Diego County.

The storylines for the "Superheroes" art in West Oakland were created by students at McClymonds High School.

"The Waterhole," on State Route 178 in Ridgecrest, was created this year by artist Olaf Doud.

raindrops falling on still water as well as being inspired by the crowds of people moving through the underpass — every person with a cell phone emitting echoes of radio waves.

"Sensing Water" uses paint and projected lighting resembling flowing water and the Aurora Borealis. This piece is influenced by real-time changes in weather and wind that effect the Guadalupe River, which flows under SR-87 at this junction. Real-time data affect the ceiling patterning at night. The inspiration for this piece began with the ever-present awareness of water issues in California. The project links both the awareness of water concerns to the new focus of the high-tech industry through the use of dynamic illumination.

In Oakland, community-based Attitudinal Healing Connection sponsored three murals in West Oakland under Interstate 580 on San Pablo Avenue, Market Street and West Street. The murals were designed and conceptualized by local middle and high school students. The project gave community youth the opportunity to be engaged in a public forum and allowed their voices to be heard.

The designers based their artwork on input from residents asked to describe their hopes and dreams for the community. The superheroes and storylines were created by McClymonds High School students. "Superheroes #3," a portion of which is featured on the Mile Marker cover, is the work of artists David Burke and Javier Rocabado with help from students from West Oakland Middle School.

District 4 worked with the city of San Francisco and Illuminate the Arts to bring the wildly popular "Bay Lights" back to the western span of the San Francisco-Oakland Bay Bridge as a permanent installation. The sculpture brings together technology with light and art to communicate images on a grand scale. The kinetic nature of the changing patterns in light draws crowds together to view the images that the artist has derived from the bay setting. Sensors that detect changes in the environment influence the patterns to change to reflect the dynamic bay landscape.

For specific information on the Transportation Art Program, refer to Chapter 29 of the Project Development Procedures Manual. MM

***Source:** District 4 Office of Landscape Architecture*

***Top left**, the underside of U.S. Highway 50 near downtown Sacramento is decorated by "Bright Underbelly," completed in 2016 by artists Hennessy Christophel and Sofia Lacin. **At right**, the western span of the San Francisco-Oakland Bay Bridge is lit up by "Bay Lights." **Bottom left**, the "Antlers Bridge Fish Scene, by artist Jerry Stuart, decorates the Antlers Bridge on Interstate 5 in Shasta County.*

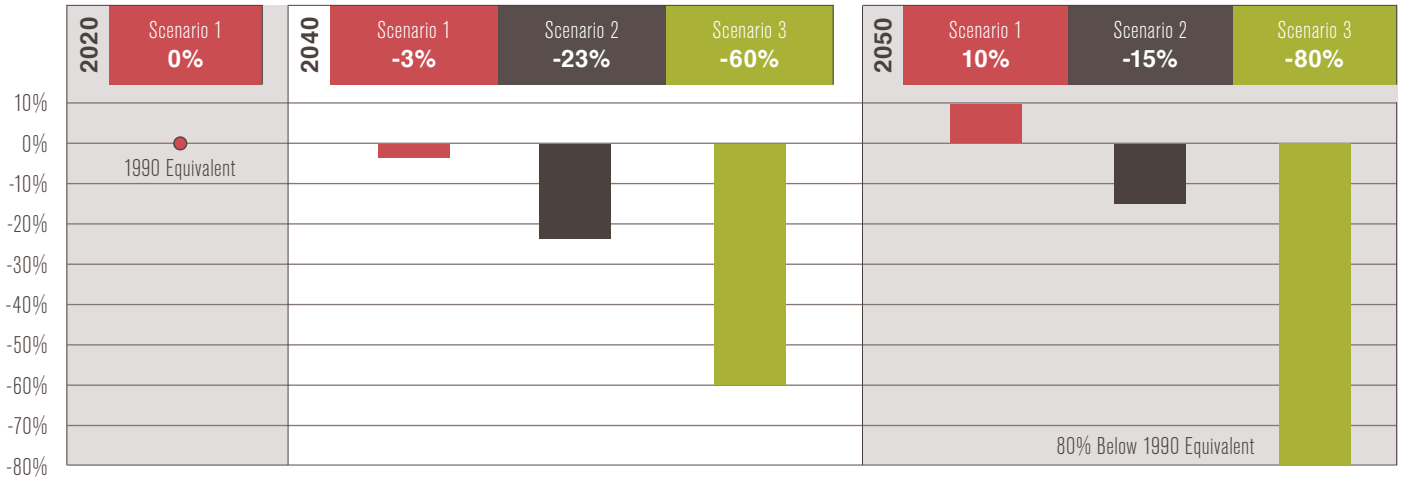
California **Transportation Plan 2040**


Caltrans photo by Steven Hellon

The California Transportation Plan (CTP) 2040 lays out a vision with a set of supporting goals, policies and recommendations for a transportation future in which more people and more products get where they need to go using only a fraction of the greenhouse gas-producing energy we use today.

Like prior plans, the CTP 2040 shows how the state's transportation system can be improved to deliver mobility and safety, as well as economic, accessibility and environmental objectives. But for the first time, the CTP adds strategies to achieve the greenhouse gas (GHG) reduction targets set by the state. The CTP 2040 complies with a 2009 law requiring a description of the steps needed to reduce greenhouse gas emissions to 1990 levels by 2020, and 80 percent below that by 2050. Publication of the plan in July culminated five

California Greenhouse Gas Emissions Change



Three transportation scenarios were analyzed cumulatively, with Scenario 3 designed to meet the GHG reduction goals through a combination of existing state and regional plans, new statewide transportation strategies and new vehicle and fuel technologies. While Transportation Scenario 3 achieves the GHG reduction goals, it also shows improvements to transportation access through significant reductions in vehicle miles traveled and vehicle hours of delay.

years of work with residents, local and regional leaders, stakeholder groups and government agencies. The plan must be updated every five years. Work on the California Transportation Plan 2045 already has begun.

The CTP 2040 is — by law — restricted from recommending specific projects. So Caltrans offers a menu of general actions needed to meet all the goals by 2040 and beyond.

The plan describes how California could fare if it adopts one of three scenarios:

- **Scenario 1** Follows current plans by the state and metropolitan planning organizations — including those by Caltrans — and assume the current mix of fuel efficiency and vehicle technology as determined by the Air Resources Board (ARB). That would yield a relative gain of 10 percent by 2050, not an 80 percent reduction.
- **Scenario 2** adds in a package of 15 transportation GHG reduction strategies such as increasing carpooling and high-occupancy-vehicle HOV lanes, improving transit services and connectivity, expanding bike and pedestrian facilities, implementing Intelligent Transportation System (ITS) strategies. It also assumes the benefits of an integrated high-speed rail system. This scenario would lead to a relative 23 percent reduction by 2040 and 15 percent by 2050.
- **Scenario 3** bundles together the first two scenarios and banks on new vehicle technologies, alternative fuels, and tailpipe emission reductions. Expected results are derived from ARB's measuring tool called Vision for Clean Air, which helps ARB evaluate hypothetical vehicle and fuel sector changes beyond current program timeframes. This scenario shows the state meeting the required 80 percent reduction in greenhouse gas emissions. The CTP 2040 is available at www.californiatransportationplan2040.org. MM

Implementation Highlights by 2040

1. Improve transit
2. Reduce long-run repair and maintenance costs
3. Improve highways and roads
4. Improve freight efficiency and the economy
5. Improve communities
6. Reduce transportation-system deaths and injuries
7. Expand the use and safety of bike and pedestrian facilities
8. Make our vehicles and transportation fuels cleaner
9. Improve public health and achieve climate and other environmental goals
10. Secure permanent, stable, and sufficient transportation revenue

These highlights, along with coordinated efforts with Caltrans' transportation partners, stakeholders and the public, will be needed to achieve the six goals of the CTP 2040: improve multimodal mobility and accessibility for all people; preserve the multimodal transportation system, support a vibrant economy; improve public safety and security; foster livable and healthy communities and promote social equity; and practice environmental stewardship.

From the Secretary

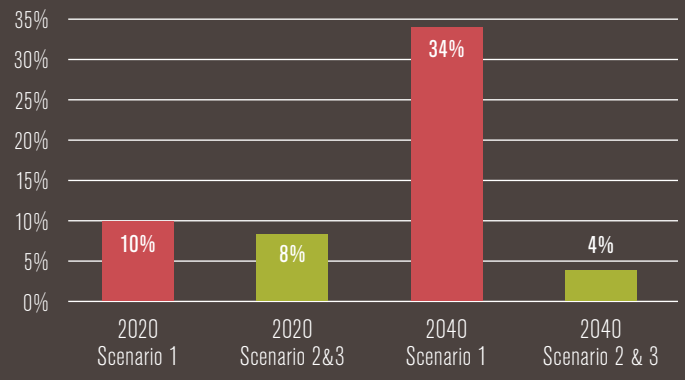
"With approved Sustainable Communities Strategies, our regional partners are already leading the way towards transportation and land use patterns that will provide cost-effective transportation solutions and also improve livability in our communities. The plans value efficient land use by locating more housing closer to job centers, and they recognize consumer demand by proposing to invest in multiple modes. This CTP 2040 is an expression of how the state will reinforce these efforts and take conforming action for the interregional transportation system."

— California State Transportation Agency Secretary **Brian P. Kelly**.

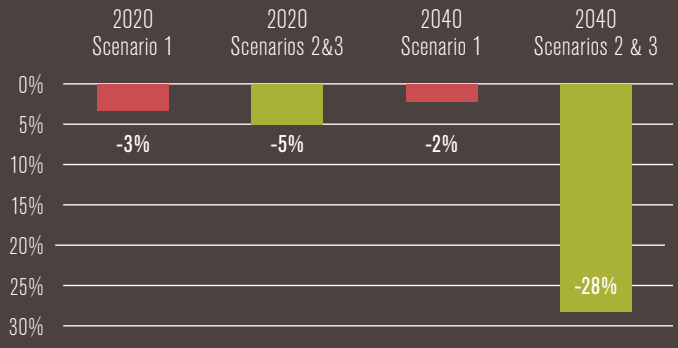
Calling for the Plan — Senate Bill 391 *(2009, Liu)*

"In developing the California Transportation Plan … the department shall address how the state will achieve maximum feasible emissions reductions in order to attain a statewide reduction of greenhouse gas emissions to 1990 levels by 2020 … and 80 percent below 1990 levels by 2050, taking into consideration the use of alternative fuels, new vehicle technology, tailpipe emissions reductions, and expansion of public transit, commuter rail, intercity rail, bicycling, and walking.… The department shall update the California Transportation Plan … by Dec. 31, 2015. The plan shall be updated every five years thereafter."

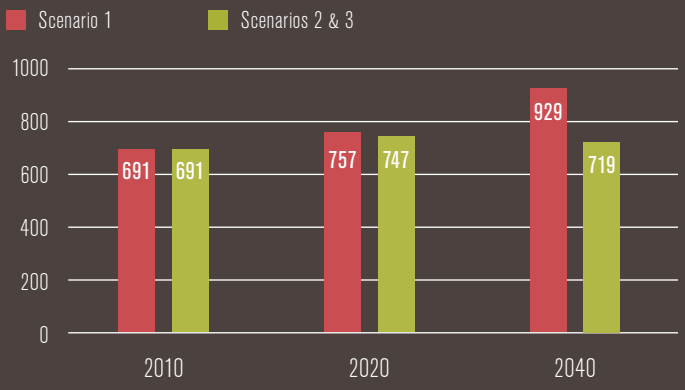
Change in Total Daily VMT by Scenario
(Relative to 2010)



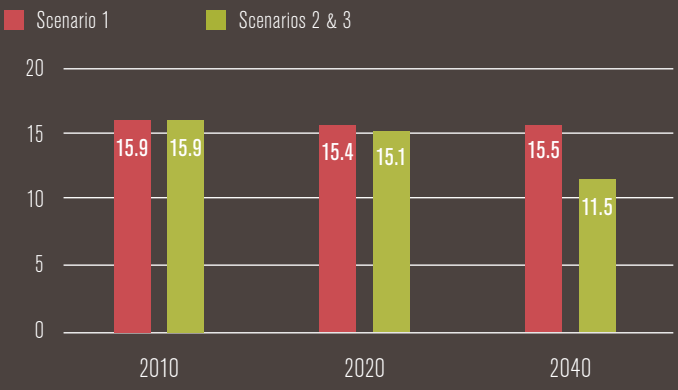
Change in Daily VMT Per Capita by Scenario
(Relative to 2010)



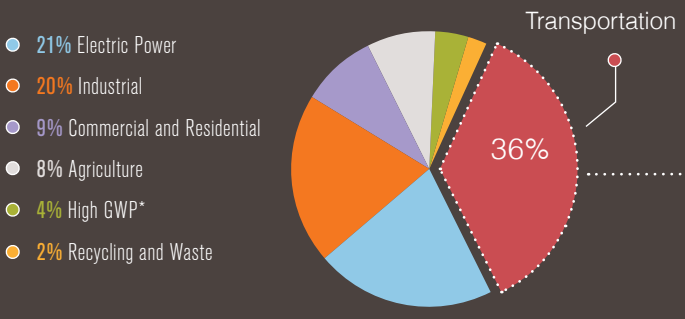
Vehicle Miles Traveled *(daily miles, in millions)*



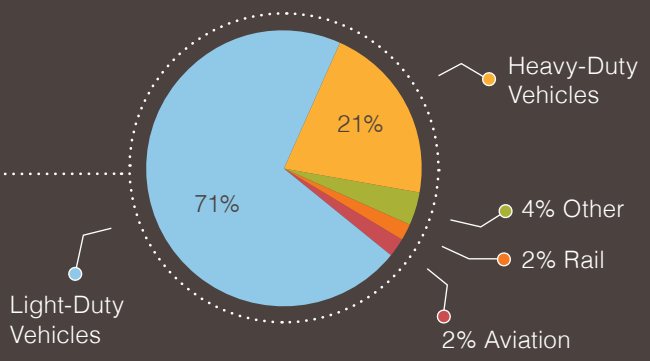
Daily VMT Per Capita *(daily miles, in millions)*



Transportation Sector Responsible for 36% of State's Greenhouse Gases



Transportation Sector's GHG Producers



*High global warming potential gases are mostly man-made gases used in industrial processes.

Caltrans Exceeds Goal for Small and **Disabled Veteran Business Contracts**

Caltrans has surpassed the state's goals for the percentage of state dollars awarded to Small Businesses and Disabled Veteran Business Enterprises in fiscal year 2015-16.

Caltrans exceeded the state's 25 percent Small Business (SB) participation goal for the third consecutive year, reaching a five-year high of 46.05 percent. Caltrans also saw its Disabled Veteran Business Enterprise (DVBE) participation rise to 5.07 percent in 2015-16, once again exceeding the state's 3 percent DVBE participation goal, and exceeding its internal DVBE performance target of 5 percent.

The Office of Business and Economic Opportunity (OBEO), home of Caltrans' SB/DVBE Advocate, attributes these achievements to several improvements introduced in recent years. These improvements include placing a greater emphasis on partnering with Caltrans contracting and procurement staff, expanding training and technical assistance services for SB/DVBE program stakeholders, and implementing data validation tools to improve the quality and consistency of Caltrans' SB/DVBE data.

The OBEO is ensuring that adequate controls are in place to continuously monitor SB/DVBE practices throughout the life of a contract, including evaluating work performance.

The OBEO also participates in outreach events, including certification workshops and networking events for SBs and DVBEs interested in bidding on Caltrans projects.

Through its statewide Small Business Council (SBC), an external advisory committee, Caltrans encourages SB, DVBE, and Disadvantaged Business Enterprise (DBE) participation in contracting and procurement activities. As of July 2016, there were 23 representatives of small business trade associations participating in the SBC. To participate, associations must represent at least 35 members, organize under the laws as regulated by the Secretary of State, and have a small business interest in Caltrans contracts and projects, specifically construction, commodities, and architectural and engineering. MM

***Source:** Mario Solis, Office of Business and Economic Opportunity (OBEO)*

Fiscal Year	Total Contract Dollars	Total Small Business/Microbusiness Dollars	SB/MB Participation *Goal: 25 percent*	Total DVBE Dollars	DVBE Participation *Goal: 3 percent*
2010-11	$1,283,167,154	$338,228,891	26.36 percent	$75,443,465	5.88 percent
2011-12	$1,872,767,028	$440,659,645	23.53 percent	$75,688,717	4.04 percent
2012-13	$2,315,162,865	$500,540,141	21.62 percent	$45,359,632	1.96 percent
2013-14	$1,074,833,766	$303,566,873	28.24 percent	$40,695,744	3.79 percent
2014-15	$1,230,371,824	$349,378,944	28.40 percent	$47,149,004	3.83 percent
2015-16	$1,129,015,763	$519,879,000	46.05 percent	$57,190,818	5.07 percent

***Source:** Caltrans Contracting Activity Report (STD. 810)*

Water Conservation **Becomes a Way of Life**


Caltrans photo by Scott Lorenzo

As California prepares for an arid future of recurring drought, Caltrans has adopted permanent water conservation strategies that have reduced its water use 62 percent since 2013, which has saved the state billions of gallons.

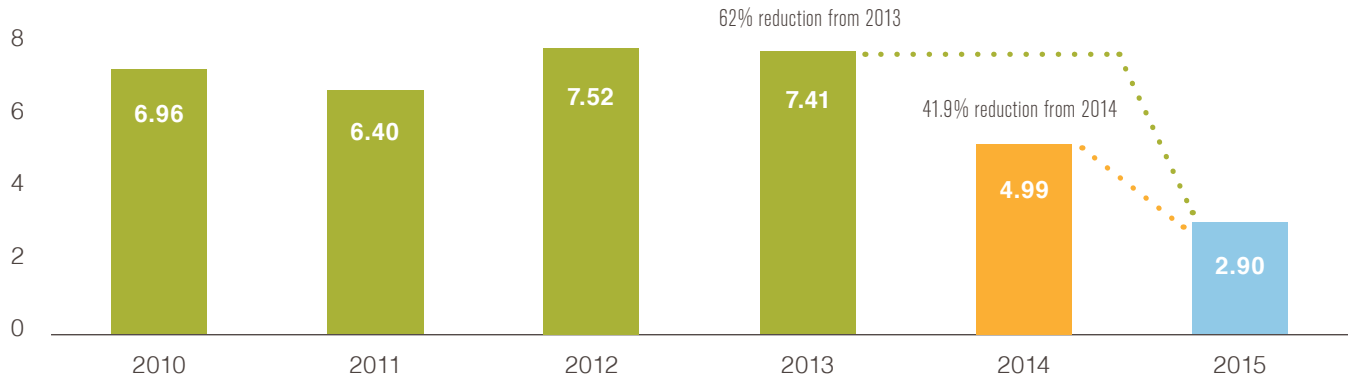
During the current drought, now in its fifth year, Caltrans has added more than 1,800 "smart" irrigation controllers that monitor soil moisture, track weather via satellite and alert water managers of malfunctions or leaks. These controllers can use about half as much water as conventional systems.

The department also is installing new pipelines and replacing irrigation systems with ones that can accommodate recycled water. It is expected that nearly 30 percent of the water used on landscaping will soon be from recycled sources. That could save Californians more than 540 million gallons of drinking water each year.

The first year after Gov. Edmund G. Brown Jr. declared a drought state of emergency in January 2014,

Caltrans Statewide Water Use, in Billions of Gallons

Source: Landscape Architecture Program, Division of Design



In 2014, Caltrans used 4.9 billion gallons of water to irrigate 32,000 landscaped acres. In 2015, Caltrans irrigated the same acreage, but used only 2.9 billion gallons. That's 92,333 gallons per acre, compared to about 163,000 gallons per acre in 2015.

Caltrans reduced its roadside irrigation by 2.4 billion gallons, or 32 percent. The following year, Caltrans cut back an additional 2 billion gallons. In those years, according to some estimates, Caltrans saved enough water to serve the annual needs of about 28,000 households in Los Angeles. In the last two years, Caltrans has cut its water use more than any other state department and has accounted for more than half of the water conserved by all state agencies combined.

In May, Gov. Brown issued an executive order calling for "long-term improvements to local drought preparation across the state," making water conservation "a way of life in California."

To meet that order, Caltrans has adopted new procedures to ensure water availability for construction work, has updated its guidance and has coordinated its efforts with water purveyors on all projects. The department has set an aggressive goal to use recycled water for all of its landscaping needs by 2036. MM

***Source:** Jack Broadbent, Division of Design — Landscape Architecture Standards and Procedures*

Caltrans Increases Recycled Water Use in 2015

Source: Landscape Architecture Program, Division of Design

Caltrans has trained almost 1,500 employees on efficient irrigation design, operation strategies and irrigation repair. Each of Caltrans' 12 regional districts has been empowered to adopt their own drought action plans.

2015 Water Conservation Accomplishments

- Achieved 62 percent reduction between 2013 and 2015.
- Connected irrigation systems to recycled water sources on 20 projects.
- Increased recycled water use from 14 percent to 23 percent for highway planting.
- Installed 1,821 "smart" irrigation controllers.
- Trained almost 1,500 staff on efficient irrigation.
- Secured $221 million in emergency funding for 109 projects, with 78 percent completed.
- Each district adopted specific drought action plans.
- Delayed $70 million in proposed planting projects.
- Continued to install required biological mitigation planting work.
- Received approximately $700,000 in rebates from water purveyors for irrigation efficiency.

Pilot Program Takes on **Wrong-Way Collisions**

Caltrans photo by Scott Lorenzo

From January through June 2015, five nighttime fatal wrong-way collisions on Sacramento-area freeways left 16 people dead. San Diego-area freeways experienced four fatal wrong-way crashes in that same period that left eight people dead. What was going on?

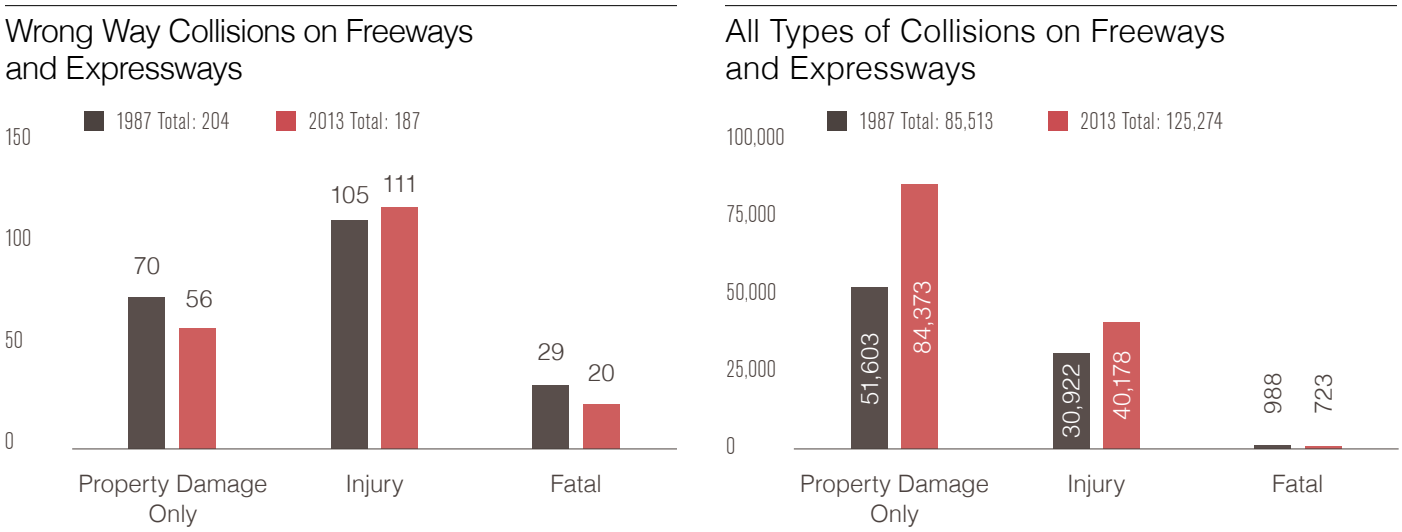
According to a report to the state Legislature on July 1, motorists driving under the influence was a contributing factor in eight of those nine cases, a little higher than the norm. The 2009 to 2013 Traffic Accident Surveillance and Analysis System (TASAS) data on fatal wrong-way collisions indicates that 69 percent of the wrong-way collisions had been under the influence of drugs or alcohol. Caltrans and the California Highway Patrol are working toward zero deaths on this state's highways, so both are looking at ways they can stop, or at least reduce, the number of deaths due to wrong-way drivers.

Supported by a mandate by state lawmakers, Caltrans has launched pilot programs in both districts using a combination of innovative methods, with all enhanced off-ramp pilot locations expected to be operational by the end of 2016.

Wrong-way collisions at freeway speeds, though horrifying, are quite rare. And last year's cluster of wrong-way collisions in the Sacramento and San Diego areas seemed contrary to years of decline prior to 2015.

Caltrans has a unit of measurement called vehicle-miles traveled to indicate the number of miles motorists travel on California roads. Between 1989 and 2013, California's freeways and expressways saw a 26 percent increase in vehicle-miles traveled. At the same time, fewer wrong-way collisions have occurred. About 35 wrong-way fatal collisions occurred annually between 1961 and 1987. From 1995 and 2013, that annual average dropped to 23 statewide. That means fatal wrong-way collisions dropped from nearly 0.4 per billion vehicle-miles traveled in 1989 to about 0.13 per billion in 2013 (the most recent year in which verified collision data is available).

In 2015, 313 reported wrong-way drivers in District 3 (the Sacramento region) caused 11 collisions resulting in injury or death. In 2016 through April 15, there were 102 reported wrong-way drivers, re-



The charts above show wrong-way collisions (left) as compared to the total number of recorded collisions (right) on California freeways and expressways during 1987 and 2013. About 0.24 percent of the collisions were wrong-way in 1987, and 0.15 percent in 2013. This represents an approximate decrease of 37.5 percent. In 2013, about 2.8 percent of all fatal collisions were due to wrong-way driving.

sulting in only one collision which had injuries or fatalities. In 2015, 100 reported wrong-way drivers were either never located or were not the cause of any known collisions. Through April 15, 2016, that number stood at 39.

Also in 2015, District 11 (the San Diego area) had 384 reported wrong-way drivers that caused eight collisions that resulted in injuries or fatalities. From January to April of this year, there were 117 reported wrong-way drivers, resulting in two collisions that had injuries or fatalities. In 2015, 353 reported wrong-way drivers were either never located or were not the cause of any known collisions. Through April 15, 2016, that number stood at 100.

The Pilot Programs

Caltrans and the CHP began a wrong-way driver working group in May 2015 to discuss potential methods to combat wrong-way drivers. Evidence shows wrong-way traffic collisions are not specific to any location or off-ramp, therefore, the working group proposed pilot projects in Districts 3 and 11. The locations are on Interstate 80, U.S. Highway 50 and I-5 in and near Sacramento and on State Route 15, I-15, I-5, and I-8 in San Diego County.

In Sacramento, this segment of Highway 50 was chosen not only due to wrong-way collisions, but also because it is a corridor between the Bay Area and South Lake Tahoe. Non-local drivers are more likely to be unfamiliar with the route and its various interchanges, making a wrong-way movement more likely if a driver exits the freeway for gas or food, then attempts to re-enter the freeway.

Although it is possible for any off-ramp to be driven the wrong-way, this project directed its focus on those ramps where the combination of ramp alignment and local road features suggested the ramp may have a higher potential for a wrong-way movement than other ramp layouts.

Freeway main lanes already feature sections of pavement markers that reflect red when the headlights of a wrong-way vehicle shine on them. These pilot projects will expand on that enhancement by installing red-backside retroreflective pavement markers on off-ramps. The goal is to get the attention of wrong-way drivers so that they turn around before they reach the main lanes.

In addition to these pavement markers already installed on many off-ramps, active monitoring systems will be added to select ramps by the end of 2016.

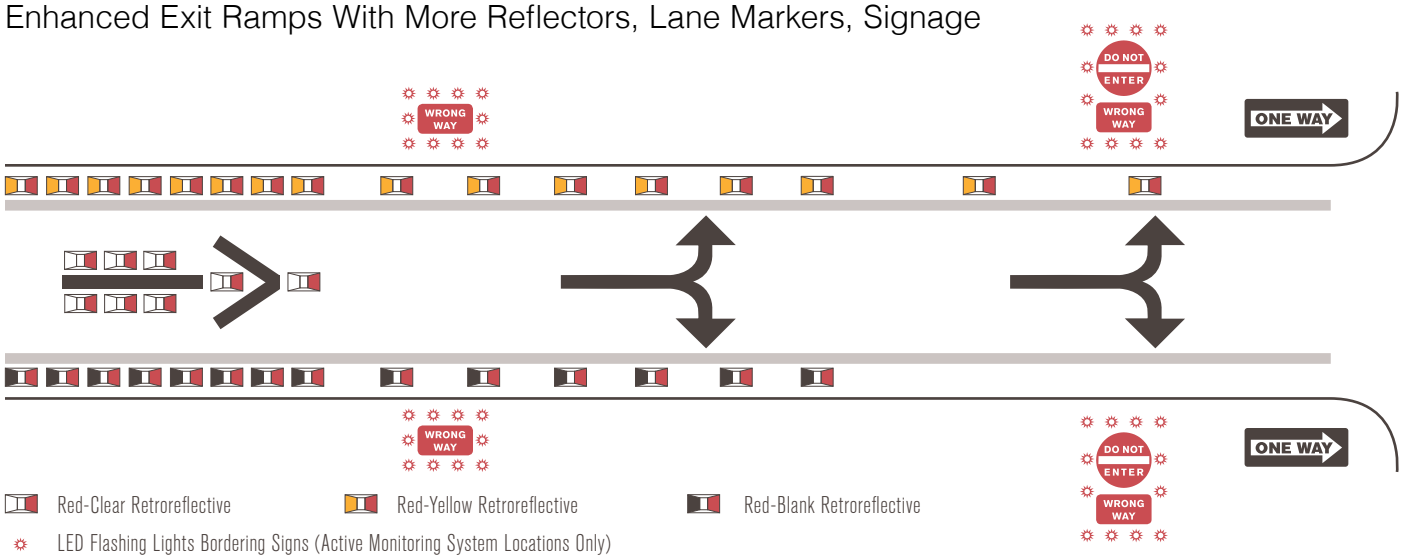
The active monitoring systems use dual radars to detect the wrong-way drivers and activate red flashing lights bordering the wrong-way signs. Caltrans and the CHP will be notified in real time of the wrong way drivers through photos and alerts sent to joint Traffic Management Centers. Once a wrong-

way driver has been detected, the centers quickly dispatch calls to the CHP and allied agencies with updates as they are received from callers, primarily through cellular phones.

A separate, auxiliary research project is being conducted by the Advanced Highway Maintenance Construction Technology Research Laboratory (AHMCT) at the University of California, Davis, with oversight and direction provided by Caltrans' Division of Research, Innovation and System Information to study the effectiveness of the pilot project enhancements with before-and-after studies. AHMCT will deliver a final report to Caltrans by Dec. 31, 2017. MM

Source: *John F. Holzhauser P.E., T.E., Transportation Permits, Division of Traffic Operations*

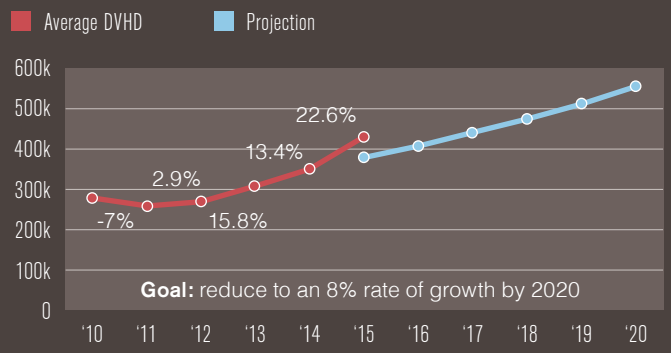
Enhanced Exit Ramps With More Reflectors, Lane Markers, Signage



Caltrans **Mile Markers**, *continued from page 1*

SYSTEM PERFORMANCE

Average Growth in Daily Vehicle Hours of Delay vs. Projection



ORGANIZATIONAL EXCELLENCE

Employees who say that they work in a positive environment
Last reporting period, December 2015 | 50%
Next reporting period | December 2016

Employees who agree that innovation is encouraged at Caltrans
Last reporting period, December 2015 | 40%
Next reporting period | December 2016

Stakeholders who say Caltrans meets their needs
Last reporting period, December 2015 | 40%
Next reporting period | December 2016

Partners who view Caltrans as a collaborative partner
Last reporting period, December 2015 | 40%
Next reporting period | December 2016

Stakeholders who say Caltrans' communication, professionalism, and service levels have improved
Last reporting period, December 2015 | 36%
Next reporting period | December 2016

Stakeholders who give positive feedback on the *Mile Marker*
Last reporting period, December 2015 | 43%
Next reporting period | December 2016

From the **Archives**

Workers clear the damaged cargo of an overturned truck from the Harbor Freeway near Slauson Avenue in Los Angeles, May 1961.

Caltrans **Districts**

All photography provided by Caltrans photgrahers unless otherwise noted

Edmund G. Brown Jr.
Governor, State of California

Brian P. Kelly
Secretary, California State Transportation Agency

Malcolm Dougherty
Caltrans Director

Kome Ajise
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Caltrans Public Affairs
1120 N Street, MS-49
Sacramento, CA 95814

Back Cover: *Ten 55-ton girders were used to rebuild the Tex Wash Bridge on Interstate 10 in Riverside County in 2015 after an unusually heavy rainstorm eroded the riverbank and caused the bridge to partially collapse. The girders were built 130 miles away by Oldcastle Precast and delivered to the site so other reconstruction work could get done simultaneously.*

Caltrans' Mission

is to provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability.

For more information on Caltrans, please visit these links:

California Department of Transportation
www.dot.ca.gov

Mile Marker Archives
www.dot.ca.gov/MileMarker

Key Links for this Issue:

Transportation Financing Summary, 2016/17
www.dot.ca.gov/budgets/docs/2016-17CaliforniaTransportationFinancingPackage.pdf

CTP 2040
www.dot.ca.gov/hq/tpp/californiatransportationplan2040

Sustainable Freight Action Plan
www.casustainablefreight.org

Transportation Art Program
www.dot.ca.gov/hq/LandArch/16_livability/trans_art

Project Delivery Report
www.dot.ca.gov/projmgmt/reports.html

Office of Business & Economic Opportunity
www.dot.ca.gov/obeo/

Water Conservation
www.dot.ca.gov/hq/LandArch/16_la_design/water_conserv/

Prevention and Detection of Wrong-Way Collisions on Freeways
www.dot.ca.gov/docs/Prevention-DetectionWrongWayCollisions-Freeways.pdf

Caltrans